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ABSTRACT

This discussion paper is intended for policy makers, program managers, technical specialists, and others seeking new tools and ideas with which to achieve environmentally sustainable development. Effective techniques from the field of environmental education and communication (EE&C) that can help biodiversity conservationists and program managers are demonstrated. The first section, entitled "A Conversation about Protecting Biodiversity," describes the need for increased public awareness and action at a time when few people understand biodiversity and why it should matter to them. The next section, "How EE&C Can Help," delves further into the specifics of how EE&C can help achieve biodiversity objectives and establishes basic parameters for EE&C. Case studies are then presented to illustrate how successful programs combine formal activities with programs through nonformal settings and informal channels. A robust EE&C strategy consists of assessment and research, planning, pretesting, implementation, monitoring, and evaluation. The third section, "Measures of Success," suggests how EE&C strategies that focus on knowledge, attitudes, and practices can contribute to meeting biodiversity indicators. Finally, "Parting Thoughts" discusses the contribution of technological advances to the field of biodiversity conservation. (PVD)

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Making Biodiversity Conservation Happen

ED 415 096

The Role of Environmental Education and Communication

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Making Biodiversity Conservation Happen:

The Role of Environmental Education and Communication

A GreenCOM Discussion Paper
By Pat Foster-Turley

June 1996

GreenCOM
Environmental Education and Communication Project
U.S. Agency for International Development

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About This Series

This discussion paper is one of a series produced by the Environmental Education and Communication (GreenCOM) Project of the United States Agency for International Development. The series is intended for policy makers, program managers, technical specialists, and others seeking new tools and ideas to achieve environmentally sustainable development. The discussion papers explore the role that environmental education and communication (EE&C) can play in helping people solve a range of environmental and development concerns. Topics covered in the series will include—

- Policy Development
- Biodiversity Conservation
- Sustainable Urbanization
- Freshwater and Coastal Resources
- Gender
- Basic Education

These papers do not provide all the answers. We hope, however, that they serve as a starting point for discussion, inquiry, and action.

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Executive Summary

"A greening of the human mind must precede the greening of our Earth. A green mind is one that cares, saves, and shares. These are qualities essential for conserving biological diversity now and forever."

M.S. Swaminathan, Former President, the World Conservation Union (IUCN)

Recognizing the environmental and economic benefits of biodiversity means acknowledging how people protect or destroy the earth's biological richness. People make decisions and take action based on information, perceptions, and alternatives. This paper demonstrates effective techniques from the field of environmental education and communication (EE&C) that can help biodiversity conservationists and program managers apply their art and science.

EE&C combines education, behavioral research, social marketing, gender analysis, participatory methodologies, and communications to change individual and group behaviors around specific environmental issues. It also draws upon lessons learned from health communication, agricultural extension, interpretation, and other fields. Applying this dynamic approach to biodiversity conservation is new, but its use is growing.

As summarized in the first section of this paper, in recent years, seminal biodiversity policies have expressed the need for increased public awareness and action if biodiversity conservation is to take place. However, while these policy statements are important, surveys and other baseline

research indicate that few people understand why biodiversity should matter to them. "A Conversation about Protecting Biodiversity" documents this reality, but highlights an example of how surveying public opinion resulted in targeted strategies that yielded environmental improvements in Belize and the Bahamas.

Next, the paper delves further into the specifics of how EE&C can help achieve biodiversity objectives. First, the section establishes basic parameters for EE&C: interventions in formal, nonformal, and informal settings that reach discrete audiences with targeted messages. Case studies from Brazil, Namibia, and the Philippines illustrate how successful programs combine *formal* (school-based) activities with programs through extension or other organized *nonformal* settings and with media and other *informal* channels. Some projects use "flagship species" to conserve the habitat in which these species live. Programs that target local communities (as, more and more, biodiversity programs do) combine EE&C approaches with viable economic alternatives for community residents. Notwithstanding their specific objectives, many successful programs share a methodology that incorporates *assessment and research*, *planning*, *pretesting*, *implementation*, and *monitoring and evaluation*. Biodiversity managers and EE&C practitioners should also recognize that integrating *gender concerns* in program design and implementation improves the likelihood of success. Finally, a process developed for a biodiversity conservation project in Ecuador shows how program managers and community members can work together to target behavior change than can lead to enhanced biodiversity resources.

Development programs in all sectors grapple with designing useful indicators; EE&C programs are no different.

"Measures of Success" suggests how EE&C strategies that focus on knowledge, attitudes, and practices can contribute to meeting biodiversity indicators. A list of measures, organized by formal, nonformal, and informal setting, serves as a starting point to determine the effect of EE&C interventions on broader biodiversity goals.

What does the future hold? Satellite tracking, enhanced computer networks, and other technological advances are contributing to the field of biodiversity conservation. Technology, however, does not hold all the answers for better conservation of the world's biodiversity. The solutions, as well as the problems, will always be in the hands and minds of people. This is how EE&C can help.

A Conversation about Protecting Biodiversity

> *"The shift to sustainable development will depend as much on education and social change as on science. Around the world modest projects are being advanced with one common result: if procedures tailored to the special case are used, economic development and conservation can both be served. People can be persuaded; they understand their own long-term interest and they can adapt."*
>
> E.O. Wilson

Biodiversity conservation is a diverse field. Not only does it involve genes, species, and ecosystems, but also it involves people. And for most people, social systems, cultures, economics, gender roles, and daily concerns are far more significant than the diversity of the rest of the natural world. Even the most "aware" individual may act in a way that degrades natural resources if to do otherwise may harm his or her family. All of this must be considered when striving to conserve the world's biodiversity.

Calls for Action

In 1992, the Earth Summit and the completion of the United Nations Convention on Biological Diversity (CBD) gave biodiversity high-profile attention. In the aftermath, many governments have developed national plans and policies that, at least in the abstract, recognize the role that a healthy

environment plays in improving the lives of their people.

In addition, more than 110 countries have ratified the CBD, which lays out a global commitment to addressing threats to biodiversity. Article 13 addresses the importance of public education and awareness and states that the "contracting parties shall—

> (a) promote and encourage the understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and
>
> (b) cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity."

Development agencies around the world have set objectives and funded projects that complement these goals. The United States Agency for International Development (USAID), for example, developed a biodiversity strategy with a framework that connects to applicable articles contained within the CBD.

Other documents have stressed the important role of humans in natural resources and biodiversity conservation. The *Global Biodiversity Strategy*, published in 1992 by the World Resources Institute (WRI), World Conservation Union (IUCN), and United Nations Environment Programme (UNEP), recommends "expanding human capacity to conserve biodiversity" through education, training, and

research relevant to local needs. And one year later, *Caring for the Earth*, produced by IUCN, UNEP, and the World Wide Fund for Nature (WWF), outlined a global framework for sustainable use and protection of the world's natural resources, including biodiversity, that recommends "changing attitudes and practices" as one of four implementation strategies by—

- motivating, educating and equipping people to live sustainably;
- campaigning for a sustainable society;
- making environmental education an integral part of formal education at all levels; and
- meeting the training needs for a sustainable society.

Likewise, the Global Environment Facility (GEF), established to fund projects in biodiversity and three other areas, increasingly looks at the human dimension in its resource allocation. GEF, which is implemented by the United Nations Development Programme, UNEP, and the World Bank, revised its operational strategy related to biodiversity. The strategy recognizes the concept of sustainable use of biodiversity across entire ecosystems (moving beyond protected areas and other such designations) and stresses the key role of stakeholder involvement.

Bio-What?

The terms "biological diversity" and the shortened "biodiversity" slipped into the international policy vernacular largely through the widespread ratification of the Convention on Biological Diversity and through dissemination of the publications described above. Having

entered policy discussions and documents, however, neither term has translated into concepts that many people understand or value.[1]

Box 1
A Definition of Biodiversity

E.O. Wilson, the noted scientist and conservationist, provides this definition of biodiversity:

> the totality of hereditary variation in life forms, across all levels of biological organization, from genes and chromosomes within individual species to the array of species themselves and finally, at the highest level, the living communities of ecosystems such as forests and lakes. One slice of biodiversity of near infinitude possible would be the variety of chromosomes and genes within one species of freshwater fish found in Cuba. Another would be all freshwater fish species of Cuba, and still another would be the fishes and all other forms of life living in each river in Cuba studied in turn.

[1]Many conservationists credit E.O. Wilson with coining the word "biodiversity" when he edited the hallmark compendium *Biodiversity* in 1988. Wilson, however, credits Walter Rosen, at the National Academy of Sciences, who organized the 1986 forum on which the book is based. As Wilson explained, "Biodiversity, I said, is too catchy; it lacks dignity. But Rosen and his colleagues persisted. 'Biodiversity,' they said is simpler and more distinctive, they insisted, so the public will remember it more easily."

For example, in 1994, the Communication Consortium Media Center conducted an extensive review of U.S. opinion polls and surveys that dealt with biodiversity and, in 1995, held ten focus groups to examine knowledge and concern for biodiversity issues. The Consortium found scant knowledge, and indeed skepticism, about the value of biodiversity and about the link between species preservation and improved quality of life for humans. If behaviors flow at least in part from knowledge and attitudes, then encouraging positive behaviors to conserve biodiversity is clearly a challenging task.

Environmental groups reacted to these findings by recognizing that they must focus their education and communication efforts to make biodiversity relevant and to help people understand the role that biodiversity plays in their lives. Some groups target people in cities, for example, by developing programs that use parks and green spaces, no matter how small, to discuss larger themes. For others, it has meant working with a particular age group. Windows on the Wild, a program of the World Wildlife Fund-U.S., targets middle-school teachers and students in school and community settings. And, throughout the world, groups are attempting to make more explicit the link between biodiversity conservation and economic improvement.

Surveying baseline knowledge and attitudes about biodiversity-related issues can prove helpful in focusing resources. The RARE Center for Tropical Conservation, for instance, has conducted pre-and post-surveys of 1 percent of the population in fifteen nations in the Caribbean and the Pacific where it operates. RARE focuses its conservation efforts on "promoting protection through pride" in national birds, butterflies, and other fauna. The questions asked may be species-specific, but the information gathered applies to

wider biodiversity conservation efforts. For instance, in Belize, surveys determined that although 95 percent of Belizians recognized the toucan as their national bird, most people did not understand the role of their country's Forestry Department. RARE used this information to design projects in cooperation with the Forestry Department. In the Bahamas, by comparison, only 45 percent of the population recognized the Bahama parrot or knew of its special role in the islands' natural and human history. Here, RARE focused more directly on the bird and its habitat. After project implementation, fully 87 percent of the people knew about the Bahama parrot and took pride in conserving it. This awareness led to increased attention to the bird and its habitat by government ministry officials, including establishment of a national park on the island of Abaco.

Unfortunately, in the field of biodiversity conservation, such pre-program assessments and focused campaigns are the exception rather than the rule. Without them, progress in even the best-intentioned biodiversity conservation program may lag. This is a major area where the tools of EE&C can help.

How EE&C Can Help

> *"Conservation can succeed only if people understand biodiversity's distribution and value, see how it figures into their own lives and aspirations, and know how to manage bioregions to meet human needs without damage. This capacity is woefully inadequate today...."*
>
> Global Biodiversity Strategy

Environmental education and communication, when carried out creatively and systematically, serves discrete audiences. EE&C focuses on the knowledge, attitudes, and behaviors of a target population to effect positive change. In the field of biodiversity conservation, target audiences range from young children in classrooms to policy makers at the highest level of government. EE&C can address short- or long-term concerns. For example, in the short term, program managers may want to curtail overharvesting of a particular land tract. Over the longer term, the goal may be to teach children about how biodiversity resources enhance their future well-being. Setting specific goals determines where to focus usually scarce resources for maximum effect.

Breadth: EE&C in Different Settings

Because biodiversity conservation messages must reach this variety of audiences, program managers consider interventions that extend through many levels of society. Loggers, for example, respond to different information and in a different format than do science teachers; journalists have different needs than rural women's associations.

One way to organize interventions is to consider the setting in which they will be delivered:

Formal EE&C activities are carried out in the formal school system, through curricula and instructional materials, teacher pre-service and in-service training, and extracurricular activities. Biodiversity topics can be taught in separate environmental courses, or, as happens more frequently, infused in science, social studies, language, or other classes. Extracurricular activities, such as clubs and competitions, can transmit environmental themes, including those related to biodiversity. In-school and extracurricular activities that consciously attempt to link student learning with family and community priorities are also effective ways to use formal settings to affect biodiversity conservation. Key elements to the success or failure of biodiversity education in a formal setting include locally relevant materials and well-designed teacher training. In Zimbabwe, for example, a curriculum that combines science, agriculture, and social studies threads biodiversity through its coverage of water, soils, and other resource topics.

Nonformal EE&C interventions are applied outside the formal school system, but through other organized settings. Biodiversity education and communication can tap into youth groups, women's associations, zoo and park programs, extension systems, community and church organizations, adult literacy classes, and other settings to provide information and encourage practices that protect biodiversity. Nonformal EE&C is crucial in understanding and resolving tensions between environmental and economic pressures. For example, EE&C can contribute to an effective agroforestry program that responds to family needs while also decreasing tree harvesting in a protected area.

Box 1
What is EE&C?

EE&C combines education, behavioral research, social marketing, gender analysis, participatory methodologies, and communications to change the behaviors of individuals and groups around specific environmental issues, while at the same time giving them the knowledge and skills to tackle a broad range of longer-term environmental concerns.

Because biodiversity conservation depends on creating practical policies and programs that are based on a sound understanding of human behavior, EE&C can be a pivotal tool. EE&C programs help uncover the intrinsic logic of human behavior which, in turn, reduces uncertainties in programs, anticipates problems and fears, and weighs the cost and benefit of proposed alternatives.

Depending on target audience and objectives, EE&C takes place in a rich variety of formal, nonformal, and informal settings, including schools, work sites, resource users' associations, NGOs, and the media. The opportunity to work through these various settings holds particular promise for biodiversity conservation, since behaviors practiced by farmers, fuelwood collectors, urban consumers, and others can have an impact on the biodiversity of a given area.

EE&C practitioners also direct programs to extension workers, park rangers, youth group leaders, and others who serve as intermediaries between researchers and resource users. In El Salvador, for example, the role that park rangers play in communicating biodiversity messages to local

residents and tourists has been strengthened. Through the USAID-funded Environmental Education and Communication (GreenCOM) Project, three-stage training was held for park staff who previously had spent most of their time in law enforcement. First, they participated in on-the-ground training to learn more about the ecosystems in which they work. Then, a smaller group learned how to plan environmental interpretation programs; a key part of their training was learning how to train others in these new EE&C techniques. Finally, the first training sessions they led were observed and critiqued by their instructors.

Informal EE&C activities reach audiences outside of organized groups, by using news media, traditional and entertainment media, community mobilization efforts, and other channels. Indeed, there are a myriad of possibilities—wherever people are when and if they choose to "tune in" to the message. As with formal and nonformal interventions, however, messages must be targeted and relevant.

In the United States, for example, although the media have covered biodiversity issues for many years, the public opinion study referred to in the previous section showed that most Americans did not respond to the messages. To remedy this situation, segmenting audiences and messages beyond "raising awareness of the general public" must take place.

In another example from El Salvador, the newspaper *El Diario de Hoy* focuses on children, by producing a Sunday supplement that once each month uses catchy graphics, games, projects, and other age-appropriate articles to focus on environmental themes. A 1995 evaluation of the supplement showed that 64 percent of the teachers and 83 percent of the

students surveyed used the materials in the classroom or at home.

The degree to which informal EE&C interventions are used throughout the world varies. A GreenCOM assessment of EE&C efforts in five countries in Africa revealed that few public or private groups took full advantage of informal settings to communicate targeted environmental messages. This may be an avenue for future biodiversity communication efforts.

Gender considerations also contribute to well-developed biodiversity EE&C programs. Women are often the de facto natural resource managers in a community, through their traditional roles collecting fuelwood and other forest products, fetching water, and growing crops. As a result, development programs often more heavily affect women than men. In many biodiversity projects, especially those around protected areas, gender roles can create unanticipated consequences, yet, often because of cultural restrictions, women do not voice their concerns. For instance, in an Integrated Conservation and Development Project in Madagascar, program managers realized that women responded to questions differently when meetings were held without men present. Women-only meetings revealed that the strategy of providing men with alternative jobs as park rangers resulted in increased hardship on the women, who had to assume all the men's traditional chores. Asking questions in an appropriate setting at the start of the project may have avoided this pitfall and led to a more successful outcome.

Depth: From Start to Finish

To implement effective biodiversity education and communication interventions, program managers need to look both at breadth—interventions taking place in formal, nonformal, and informal settings—and depth. It is tempting to say that, for instance, since 10,000 posters on sea turtles were distributed, sea turtle conservation improved. But did it? Where were the posters placed—would people who fish or collect eggs see them? What did the posters look like and say? Did they influence people's behaviors when faced with turtles in their nets or with eggs on the beach? Did the overall incidence of sea turtle capture decrease in the target area?

Box 3
Five Steps of an EE&C Intervention

1. **Assessment and research** of the existing situation in relation to priority environmental concerns.

2. **Planning** in a process involving all stakeholders.

3. **Pretesting and revision** of programs, products and messages

4. **Implementation** to targeted audiences.

5. **Monitoring and evaluation** of effects on concerned stakeholders.

Likewise, training five hundred teachers about biodiversity

topics does not automatically mean that they transmitted these concepts more effectively to their students. Possibly not. Did the training course present information relevant to the teachers and their students, using demonstrations and materials readily available in the local environment? Did the teachers actually use the new curricula and materials? Did their students show an increased knowledge of the concepts involved in pre- and post-testing?

Effective EE&C approaches include five steps: assessment and research, planning, pretesting, implementation, and monitoring and evaluation (see Box 3). The case of the golden lion tamarin illustrates these steps in a biodiversity framework.

Brazil: Tamarins as Teachers

Golden lion tamarins are small endangered primates who live only in Brazil's Atlantic Forest. Deforestation threatens their habitat and has broader implications for the region's rich biological resources. Since 1983, a consortium of international and Brazilian NGOs and government agencies have worked together to conserve the tamarin through captive breeding, reintroductions, and EE&C strategies. World Wildlife Fund has spearheaded the EE&C efforts, using a process that corresponds to the steps listed in Box 3.

In baseline *assessment and research*, WWF determined that 41 percent of the people living in golden lion tamarin habitat did not recognize the animal. A related finding that fed into program planning: few residents expressed pride in their forest surroundings. Initial surveys also ascertained the most frequent communication channels in the area. Although

local communities by and large had no telephones or electricity and had low adult literacy rates, 80 percent viewed televisions powered by car batteries, and 99 percent listened to radios.

Planning began in earnest with full participation of community leaders, who gradually began to envision a reserve and educational program as a local resource. Results from assessment surveys helped define a media-based EE&C strategy that used tamarins to build awareness of the connections between local wildlife and habitat and to instill pride in both.

Press releases, videos, public service messages for radio and television, posters, traveling exhibits, and a course manual were developed through an extensive process of *pretesting and revisions*. The program was then *implemented* in one municipality and expanded to two others for a coverage of 180,000 people.

A feedback loop linked efforts to *monitor and evaluate* behavior and attitudes with modifications and improvements of program materials and approaches. The first two-year evaluation found that knowledge and attitudes of local adults had changed and that a number of property owners had become involved in monitoring and protecting the tamarins on their own land. Results from this and succeeding evaluations continued to shape the elements of this project.

More recently, researchers have determined that the tamarin population needs more forest habitat to survive (25,000 hectares by the year 2025) than previously thought. To help accomplish this objective, an EE&C strategy now focuses on landowners, both resident and absentee. So far, more than a dozen landowners have agreed to allow tamarins on their

property (this includes a pledge to conserve their forests for the tamarins), with a waiting list of others willing to participate.

Namibia: Cheetah Challenges

The "flagship species" approach, which uses charismatic animals in campaigns to protect habitat and biodiversity, is a powerful education and communication tool (See Box 4). The RARE and golden lion tamarin examples cited earlier illustrate aspects of the flagship species approach. Another strong example is found in the work of the Cheetah Conservation Fund (CCF). The largest concentration of the world's remaining cheetahs live in Namibia, usually on private farmland. The resulting conflicts with livestock often lead farmers to killing cheetahs. Perhaps not surprisingly, early surveys conducted on 385 farms found that most farmers had negative feelings towards cheetahs and practiced no other livestock management technique besides killing them.

To protect the cheetah, CCF has mounted a comprehensive campaign through formal, nonformal, and informal settings. In the formal sector, CCF worked with the Ministry of Education to develop classroom materials on predators, which made their way into national environmental education curricula. Moreover, the Ministry has placed a question about cheetahs on its national secondary-level exam to measure whether knowledge level changes over time. CCF also has organized assemblies, writing contests, and sister-school programs. Since farmer behavior is an obvious priority, CCF holds meetings and publishes a newsletter to discuss other techniques of predator control, such as keeping

Box 4
Flagship Species

The "flagship species" approach to biodiversity awareness concentrates its efforts on beautiful, cute, powerful, and otherwise admired animals that can act as ambassadors for their habitats. Flagship species are often maintained in zoos in developed countries and can help in fund-raising efforts for host-country programs.

The Species Survival Commission (SSC) of the World Conservation Union (IUCN), promotes this approach by supporting and encouraging networks of international specialists concerned with the conservation of particular taxa. Increasingly the human aspects of conservation programs are coming to the forefront, as biologists link with educators to raise awareness of related conservation concerns using their favored species as the vehicle.

Some groups of flagship species of particular importance to biodiversity conservation and awareness programs include:

Large Cats	Select habitats worldwide
Otters	Wetlands and aquatic habitats
Parrots	Tropical forests
Primates	Tropical forests
Rhinoceroses	Select habitats in Asia and Africa
Sea Turtles	Tropical oceans and beaches
Whales	Oceans of the world

At the same time, care must be taken to avoid either the reality or the perception that the interests of animals are being unduly placed over those of humans.

donkeys with their herds to frighten off cheetah, keeping young heifers close to the homestead, and conserving wild prey. By keeping in close contact with the 385 farms in the original study, CCF watches changes in attitudes and behavior. Finally, in terms of an informal EE&C intervention in the CCF campaign, people's fascination with cheetahs has resulted in national and international media coverage about conservation efforts.

Philippines: Coastal Concerns

Marine biologists consider the waters surrounding the Philippines as a "marine biodiversity hotspot" of the Pacific. The Philippines, with its dense population, long coastlines, and economic dependence on fisheries, has also been a test case for coastal resource management programs (CRM) for more than two decades. By ensuring the sustainable use of coastal resources, CRM also protects and enhances the valuable biodiversity of near-shore waters. CRM often uses EE&C techniques at the community level, involving local families who catch or process fish, business owners, community leaders, and others to build consensus around natural resources issues and solutions.

The ASEAN Coastal Resource Management Project, initiated in 1986, provides one example. In the Philippines, this project focused on developing a management plan for the coastal resources of the Lingayen Gulf through a large-scale public participatory effort. Public interest heightened and led to the government's five-year Fisheries Sector Program. Under this program, community-based CRM projects are now being implemented in twelve priority bays throughout the Philippines.

Box 5
Marine Biodiversity and EE&C

As governments consider how to implement the Convention on Biological Diversity, marine biodiversity has become a major topic.

This attention brings with it an increased demand for EE&C programs. Coastal resource management (CRM), spearheaded by such key players as the Coastal Resources Center at the University of Rhode Island, combines natural resources management with capacity building, community participation, and other concerns to which EE&C strategies can contribute.

Other community-based coastal resource management programs are currently being carried out elsewhere throughout the Philippines, as the government and international donors recognize the return on their investment of capacity-building and community-empowering efforts.

Ecuador: Which Behaviors to Target?

As noted throughout this paper, changing behaviors should be a key goal of biodiversity conservation and EE&C projects. But *which* behaviors should change—which single, observable actions that people take under specific circumstances should a program introduce, teach, and support to protect biodiversity or to help solve another environmental concern?

In 1995, GreenCOM worked with the USAID-funded Sustainable Uses for Biological Resources (SUBIR) Project in northwest Ecuador on a process to identify specific behaviors by buffer-zone residents that affect the area's resources. SUBIR's overall goal is to conserve biodiversity in the Cotacachi-Cayapas Ecological Reserve and its buffer zone through the creation of incentives and economic alternatives for local populations. GreenCOM worked with a multi-disciplinary team composed of SUBIR staff, local extensionists, and community members to develop a participatory methodology for selecting target behaviors related to sustainable use of land resources and for monitoring changes of these behaviors. Through the application of this methodology, the team negotiated the selection of target behaviors that provide the intersection between ideal environmental behaviors necessary to conserve biodiversity and those that are feasible for farmers to carry out on a sustainable basis.

First, over the course of several work sessions, the team developed and refined a list of thirty ideal behaviors related to sustainable land use that would help conserve the biodiversity resources of the area. A smaller group then conducted research in two communities to determine which of these behaviors were currently being carried out and by whom, as well as what factors contributed to their performing or not performing the behaviors.

With the research findings in mind, the team came back together to review their list of ideal behaviors. They examined each behavior against six criteria:

- potential for impact on biodiversity
- existence of approximations of the ideal behavior (are people already performing a behavior that is at

least close to the ideal?)
- positive consequences
- compatibility with cultural norms or current practices
- cost
- complexity

By applying these six criteria to the original list of ideal behaviors, the team developed a list of twenty-nine specific land-use behaviors that would have a positive impact on biodiversity and that were realistic for farmers to perform (for an example, see Box 6).

Box 6: Example of ideal vs. feasible behaviors in the SUBIR Project

Ideal behaviors related to Integrated Pest Management	Feasible behaviors, after research and observation in the field
—Use natural pesticides. —Use only "approved" pesticides when it is absolutely necessary, in minimum quantities.	—Use organic and chemical pesticides and fungicides in the following way: *Blue label*: January to May *Green label*: October to December *Combined* (organic and green label): June and July, October and November *Organic*: August and September

Through processes like this, program managers can marry biodiversity goals with people's perceptions, skills, access to resources, and other "real world" concerns. SUBIR has since adopted the methodology for application to its other major project components. It has also been used in other USAID and non-USAID funded projects in Ecuador.

Measures of Success

> *"In our model of how human activities interact with the environment, indicators of biodiversity are a proxy for measures of fundamental life-support functions."*
>
> World Resources Institute

Program managers must eventually measure the successes of their programs and extract lessons learned from the failures. This work usually stems from the prior development of strategic objectives to guide program implementation and indicators to measure progress of projects along the way. For example, participants in a USAID environmental indicators workshop held in May 1995 proposed five categories of biodiversity indicators:

- critical habitat conserved
- habitat types prioritized
- critical species protected
- area restored (i.e. reforestation)
- local resource management stewardship, adoption of "sustainable" practices, economic benefits.

People affect whether these indicators are met. For instance, a measure of "critical habitat conserved" can involve an accounting of families that cleared vegetation along stream banks after they participated in extension programs on the subject. In a different situation, surveys on awareness of the importance of local biodiverse fauna might contribute to meeting the indicator "critical species protected."

Another way to help program managers determine whether their EE&C strategies have helped meet their biodiversity

objectives is to develop a separate set of indicators related to the EE&C intervention itself. For example,

*In **formal** settings:*

- Number of school districts that include biodiversity and other environmental material in their curricula;
- Numbers of teachers trained in biodiversity and related conservation issues who apply this knowledge in their classrooms;
- Increased quantity, quality, and availability of biodiversity conservation materials used in classes and extracurricular activities;
- Increased capacity by local school systems, teachers' colleges, public education agencies, and other institutions to develop and deliver effective biodiversity education.

*In **nonformal** settings:*

- Numbers of park guards, extension workers, NGO staff, citizen group representatives, and others trained in biodiversity conservation, interpretive techniques, and other skills related to biodiversity conservation who pass these lessons on to others;
- Number of national parks and protected areas, zoos and botanic gardens and other non-formal facilities using locally relevant messages on biodiversity conservation in their programs and signage;
- Percentage of families that learned the skills and apply particular principles of sustainable use gained through extension education programs or other EE&C;
- Increased capacity of local groups to communicate and mobilize around biodiversity issues.

In looking at messages communicated through the media and in other ***informal*** settings, program managers can examine indicators that looks at the relationship of a target audience with specific behaviors that help protect biodiversity. In the Philippines, for example, GreenCOM has proposed a graduated set of indicators that measure the impact of an environmental communication strategy on behaviors related to natural resources and to industrial environmental management (Hernández and Booth, 1996). In the context of biodiversity conservation, it may be fruitful to examine—

- **Exposure:** Percentage of the target audience exposed through the media and other means to messages about a biodiversity-conserving behavior;
- **Knowledge:** Percentage of the target audience who have knowledge of the benefits to biodiversity of the behavior and have acquired the skills and self-competence to perform it;
- **Agreement:** Percentage of the target audience who agree with the potential benefits of the behavior;
- **Intention:** Percentage of the target audience who state they plan to practice the behavior;
- **Trial:** Percentage of the target audience who have tried the behavior;
- **Adoption:** Percentage of the target audience who have adopted the behavior on a regular basis;
- **Advocacy:** Percentage of the target audience who promote the behavior to others, such as to family members, others in the community, or officials.

Finally, it may be useful to assess increased capacity of media, performing groups, research institutions and others to conduct biodiversity education and communication.

Parting Thoughts

> *"Thus an immediate—as opposed to a geological—solution to the problem of maintaining global biodiversity seems to depend on the collective behaviors and perceptions of people toward their habitat."*
>
> David Challinor, in E.O. Wilson's landmark book *Biodiversity*

Biodiversity conservation is integral to the quality of life most people expect. Unfortunately, as this paper points out, not many people around the world realize this fact, or are engaged in behaviors that promote biodiversity. Effective programs must link scientific knowledge, information dissemination, and economic considerations.

Technology and Biodiversity Education

Satellite imagery and radio tracking are among the new technological tools becoming available to field workers engaged in species conservation. They can fit animals such as elephants, sea turtles, albatrosses and whales with telemetry devices and follow them for long distances through satellite signals accessed from remote computers. These advancements combined with the increasing computer literacy of children and adults and the growing accessibility of computer equipment resulted in the Satellite Elephants project.

In this project, conducted by an international consortium led

by the Smithsonian Institution's Conservation and Research Center, rogue elephants in Peninsular Malaysia have been fitted with telemetry devices and translocated to areas where they will have less direct conflict with humans. Computers and related educational displays and materials at sites in Malaysia and the United States enable tracking from afar by laypeople. Each day the elephants' movements are graphically depicted on computers, along with information on wildlife-human dilemmas, such as crop destruction from roaming elephants, forest habitat loss from overlogging, and other issues.

This is only one example of how new technology can affect biodiversity education and communication programs in the future. EE&C strategies will have to balance these technological tools with the needs and perspectives of the people to whom the strategies are addressed.

Summary

To summarize the main points in this discussion paper:

- Biodiversity policy statements and documents increasingly recognize the role of public awareness and action in enhancing or damaging biodiversity.

- Despite this recognition, the reality is that most people do not understand the relevance or value of biodiversity conservation.

- Environmental education and communication can help by focusing on the knowledge, attitudes, and behaviors of a target population to effect positive change.

- Effective EE&C programs that transmit messages about biodiversity conservation can take place through formal, nonformal, and informal settings.

- A robust EE&C strategy consists of five steps: assessment and research, planning, pretesting, implementation, and monitoring and evaluation.

- Gender concerns contribute to well-designed EE&C programs and, more importantly, to the long-term success of biodiversity projects.

- Successful approaches have included focusing on "flagship species," training of park rangers and other intermediaries, community participation and ownership of economic alternatives, school programs, and more. No one right approach exists: it depends on the goals and realities at hand.

- If program managers would like people's behaviors to change, they must determine which behaviors that benefit the environment are feasible for people to perform, and then target resources accordingly.

- EE&C can help affect whether biodiversity indicators are met. Likewise, indicators can be developed around the EE&C interventions themselves to determine if they are contributing to broader biodiversity goals.

Environmental education and communication strategies can help conserve biodiversity. The tools are available—now they must be applied. Ultimately, the solutions lie in the hands and minds of people.

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